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09/678,611	10/04/2000	Kohji Sakai	198004US2	7156

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EXAMINER	
PHAM, HAI CHI	

ART UNIT	PAPER NUMBER
2861	

DATE MAILED: 08/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/678,611	SAKAI ET AL.	
	Examiner	Art Unit	
	Hai C. Pham	2861	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9 and 11-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9 and 11-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

It is noted that Applicants argued that the negative/positive refracting power in the sub-scanning direction of the scanning lens is based on the formula as described by Yoshisada Hayami in the book titled "Optics in Optical Device", which is partially correct. In fact, the refracting power (P) of the scanning lens is actually calculated by the following formula:

$$P = \left(\frac{1}{r1} - \frac{1}{r2}\right)$$

In which:

r1 denotes an entrance surface curvature radius of the scanning lens;

r2 denotes an exit surface curvature radius of the scanning lens.

The above-mentioned refracting power formula will be applied to demonstrate the refracting power in the sub-scanning direction of the scanning lens as taught by the cited prior art as follows.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 1-5, 9, 11-13, 15, 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Suzuki et al. (U.S. 6,256,133).

Suzuki et al., a previous cited prior art, discloses in Fig. 2 an optical scanning apparatus condensing a beam deflected by an optical deflector (polygon mirror 16) so as to form a beam spot on a surface to be scanned (scanned surface 19 of a photoconductive body), comprising two lenses (first and second scanning lenses 20 and 21), wherein:

- a lens (first scanning lens 20) on the side of the optical deflector has a negative refracting power in sub-scanning direction (see the listed sub-scanning radius Rs of curvature on the surfaces of the first lens, e.g., first and second surfaces, at col. 22, lines 5-15, where r1 = -50.145 and r2 = -199.813, which result in P = -0.0149 indicating that the refracting power in the sub-scanning direction of the first scanning lens 20 is negative),

- a lens (second scanning lens 21) on the side surface to be scanned has a positive refracting power in the sub-scanning direction (see the listed sub-scanning radius Rs of curvature on the surfaces of the second lens, e.g., third and fourth, at col. 22, lines 5-15, where r3 = -72.026 and r4 = -27.588, which result in P = +0.0223 indicating that the refracting power in the sub-scanning direction of the second scanning lens 21 is positive),
- at least one lens surface of the lens surfaces of the two lenses is such that a shape in the sub-scanning section is a non-arc shape and said at least one lens surface has a non-coaxial surface (the first through the fourth surfaces are special surfaces "in which the change of its sub-scanning curvature is non-symmetrical in its main scanning direction relative to the optical axis") (col. 22, lines 17-22),
- two lens surfaces such that a curvature in a sub-scanning section varies in the main scanning direction are formed in different lenses (the second surface [of the first lens 20] and the third surface [of the second lens 21] both having a shape such that the radius curvature Rs in the sub-scanning section changes along the main scanning direction) (col. 16, lines 42-45),
- at least one surface of said at least two lens surfaces is such that change in the main scanning direction of a curvature in a sub-scanning section thereof is asymmetrical (the third surface being a special surface having a sub-scanning curvature, which is non-symmetrical in the Y direction, e.g., main scanning direction) (col. 16, lines 57-59),

- said optical system is such that a lateral magnification (β_0) in the sub-scanning direction at a central height and a lateral magnification (β_h) in the sub-scanning at any image height satisfy the following condition:

  $0.93 < |\beta_h / \beta_0| < 1.07$ (col. 9, lines 3-5)

- The surface such that a shape in a sub-scanning direction is a non-arc shape is a sub-non-arc surface such that the non-arc shape changes according to the position in main scanning direction of the sub-scanning direction (at least the second surface of the optical system having a surface shape in the main scanning surface of a non-circular arc shape) (col. 16, lines 32-37),
- Said lens on the side of optical deflector (first imaging lens 20) has a positive refracting power in main scanning direction (curvature radius in the main scanning direction Rm of the first surface being positive) (col. 22, lines 5-15),
- A lateral magnification (β_0) in the sub-scanning direction at a central height of said optical system is equal to 1 (Fig. 12C), which amply satisfies the condition as claimed in claim 4,
- A shape of the sub-non-arc surface in a main scanning section is a non-arc shape (the second surface of the optical system having a surface shape in the main scanning surface of a non-circular arc shape) (col. 16, lines 32-37),
- In each of the four lens surfaces of the two lenses, the curvatures in the main and sub-scanning directions are different from one another (col. 15, lines 5-15),
- A non-arc amount, which is an amount of difference of the non-arc shape in the sub-scanning section of the sub-non-arc from an arc, changes asymmetrically in

the main scanning direction (the third surface being a special surface having a sub-scanning curvature, which is non-symmetrical in the Y direction, e.g., main scanning direction) (col. 16, lines 57-59),

- An effective writing width W and a width Fs of sub-scanning curvature of field in the effective writing width satisfies the following condition:

  $Fs / W < 0.005$ (col. 6, lines 33-40)

- Said two lenses have at least two lens surfaces each of which is such that change in the main scanning direction of a curvature in a sub-scanning section is asymmetrical (in a further embodiment, the second and third surfaces are both special surfaces in which the change of their sub-scanning curvature is non-symmetrical in the main scanning direction) (col. 20, lines 35-41), and at least two lens surfaces of said at least two lens surfaces have an air separation therebetween (the two special surfaces, e.g., second and third surfaces, being on two different lenses and thus there exists an air separation in between),
- The optical scanning device being a single beam system having a coupling lens (coupling lens 12) coupling the beam from the light source (laser 10) to a line-image forming optical system (cylindrical lens 14) forming the coupled beam in a line image long in the main scanning direction or in proximity of the deflection reflective surface of an optical deflector (polygon mirror 16) (Fig. 2) (col. 11, lines 1-19),
- An electrostatic latent image being formed on the photosensitive surface (19) of the photoconductive body and being [inherently] visualized into a toner image.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. in view of Takada et al. (U.S. 6,445,483).

Suzuki et al. discloses all the basic limitations of the claimed invention including the curvatures in the main and sub-scanning directions in each of the four lens surfaces of the two lenses are different from one another (col. 15, lines 5-15), but except for the optical system comprising an anamorphic optical lens, and the spot diameter being equal to or smaller than 50 μm.

Takada et al. discloses an optical scanning apparatus condensing a beam deflected by an optical deflector (polygon mirror 3) so as to form a beam spot on a surface to be scanned (surface 14), comprising two lenses (first and second scanning lenses 12 and 13, Fig. 1), wherein a lens (first scanning lens 12) on the side of the optical deflector has a negative refracting power in sub-scanning direction (the radius of the entrance surface of the first scanning lens 12, e.g., 72.17772, being larger than the radius of the exit surface of the first scanning lens, e.g., 53.03585) (Table 1), a lens (second scanning lens 13) on the side surface to be scanned has a positive refracting power in the sub-scanning direction, and at least one lens surface of the lens surfaces

of the two lenses is such that a shape in the sub-scanning section is a non-arc shape (second scanning lens 13 having the exit surface being non-arcuated and having a positive refractive power in the sub-scanning direction) (col. 12, lines 34-59). Takada et al. further teaches said optical system comprising an anamorphic optical system (col. 7, lines 45-60), and the spot diameter in each of the main and sub-scanning directions being equal to or smaller than 50 μm (col. 4, lines 54-59).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to provide the optical system of the device of Suzuki et al. with an anamorphic optical system as taught by Takada et al. The motivation for doing so would have been to prevent a disfiguration of the beam spot on the scanned surface as suggested by Takada et al.

3. Claims 14, 16-18, 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. in view of Ota et al. (U.S. 5,305,022).

Suzuki et al. discloses all the basic limitations of the claimed invention except for the plurality of light sources, which are provided as a laser array with the interval of the light emitting points equal to or larger than 10 μm.

Ota et al. discloses a multi-beam scanning recording apparatus having a semiconductor laser array for simultaneously scanning the surface of the photosensitive drum to form an electrostatic latent image, which is developed to become a visible toner image, wherein the interval between the light emitting sources in the semiconductor laser array can be set at least at 10 μm (col. 1, lines 36-48).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to provide a semiconductor laser array as taught by Ota et al. in the device of Suzuki et al. for the purpose of providing a high-speed optical scanning device.

Response to Arguments

4. Applicants' arguments with respect to claims 1-9 and 11-22 have been considered but are moot in view of the new grounds of rejection.

5. Applicants argued in their response filed in 01/20/06 with regard to Suzuki (US 6,256,133) not teaching "said at least one lens surface has a non-coaxial surface" since the equation (9) that determines the non-circular arc shape of the scanning lens as listed at col. 12, line 39, lacks the expression related to the Z-direction required for a coaxial shape of the scanning lens surface. It is noted that the above-mentioned equation (9) as listed at col. 12 is an incomplete equation. Regardless, Suzuki teaches such non-coaxial surface of the scanning lens at the very specific examples 6 and 7, where not only the first scanning lens (20) has a negative refracting power in the sub-scanning direction but at least one of the surfaces of the first scanning lens is a non-coaxial surface (see Figs. 15A and 18A, which supports the respective Examples 6 and 7).

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hai C. Pham whose telephone number is (571) 272-2260. The examiner can normally be reached on M-F 8:30AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vip Patel can be reached on (571) 272-2458. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Hai Li Pham

HAI PHAM
PRIMARY EXAMINER

August 4, 2006